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A TYPHOON IN SICILY.

In the early morning of the 7th of October, 1884, Etna was seen to be covered with a mantle of clouds, which spread themselves in a north-west direction. At eight o'clock there was a barometric depression throughout the whole western part of Sicily, the mercury falling two millimetres. During the typhoon, which began at about noon, the barometer registered 761.1 millimetres, whereas in the morning at nine o'clock it stood at 761.8 millimetres. The normal average is 762.5 millimetres. The thermometer at nine o'clock was 22.5° C., and during the storm went up slightly. The relative humidity at nine was 0.78,



A VIEW NEAR CATANA AFTER THE TYPHOON.
(From *La Nature*.)

but at noon had risen to 0.88. At eight o'clock the wind was from east-north-east, blowing gently, and at noon was from the south-east. At 12.30, near the Passo Portese, 18 kilometres from Catana, a dark cloud in the form of a spout was seen to form. The rotary movement was opposite that of the hands of a watch, and the spout travelled across the country from west-south-west to east-south-east at the rate of 28 kilometres (17 miles) per hour. It frequently raised itself above the ground for some moments, and then again touched the land to complete its devastation. When near Ognina, it left the land and went to sea, where it died out. The noise produced by the storm has been compared to that caused by many trains of cars passing over an iron bridge at high speed. There were very few flashes of lightning, and only two reports of thunder loud enough to be heard above the storm. Hailstones of great size fell on the northern border of devastation, causing much damage. They were very rough, and some were as large as oranges. One weighed 300 grams. The zone of greatest devastation was about 27 kilometres in length (not including the 5 kilometres at sea), with a breadth of 350 metres. Twenty-seven inhabitants were killed, and five hundred wounded. Many houses were destroyed, trees torn up by their roots and carried away, and in one place a piece of lava weighing 8 kilograms was

thrown through a window 10 metres from the ground, while another pierced a house like a bullet.

CREEPING OF RAILS.

It has been observed by those having charge of railroad-tracks, that in some places the rails move longitudinally, or 'creep.' On double-tracked lines the rails tend to move in the direction of the traffic; but on single-tracked roads the alternating direction of the trains will naturally neutralize this tendency. Again: on long inclines or grades the track may creep down hill,—a phenomenon which is reasonably attributed to expansion and contraction from successive changes of temperature, the rails slipping in the direction of least resistance; that is, expanding down hill, and contracting up hill. In both cases there is generally little difficulty in arresting the movement by driving spikes into the ties through the notches provided for this purpose, either in the rail-flanges at or near their ends, or in the angle splice-bars so commonly used at joints. The rail often exerts considerable force against these spikes or bolts, and has been known, in some instances, to partially



EFFECTS OF THE TYPHOON IN A CATANA OLIVE-GARDEN.
(From *La Nature*.)

cut or shear them off. The thrust is resisted by the ballast in which the ties are bedded.

A curious instance of rail-creeping, which it is difficult to explain, was given in the *Railroad gazette*, Dec. 5, 1884, where it is stated, that on a piece of single track on the New-York and New-England railroad near Hartford, Conn., a part of which was level, and the rest on a grade of twenty feet per mile, with an equal number of trains each way, one rail moved down hill five feet and one inch in the course of a year, and the other moved eighteen inches in the reverse direction. It has been suggested that the spikes in the two ends of the ties or sleepers may not have been properly alternated, thus allowing the ties to turn horizontally from the correct position at right angles to the rails.

That the elastic yielding of the ballast under the passing loads, and the slight rocking of the ties, absorb or resist the creeping force, would appear from the fact that the tendency to creep is most pronounced where the supports under the rails are held rigidly, as in bridges. On the Harrisburg bridge, over the Susquehanna, the Pennsylvania company encountered this difficulty, but arrested the movement by spikes through the angle-splices at joints. On the St. Louis arched bridge, and its east approach, there is found a most remarkable example of creeping rails. Prof. J. B. Johnson, in a paper read before the Engineers' club of St. Louis,¹ discusses this case at length, and offers an explanation.

The bridge proper is 1,600 feet long; the east approach, a series of short girders on iron columns, is 2,500 feet long, with a grade rising towards the bridge of eighty feet per mile; both are double-tracked. As it was thought by those in charge of the bridge that fastenings at frequent intervals, to resist the movement, would bring too great a strain upon the structure, the attempt was made to restrain the rails by holding them firmly at isolated points some distance apart, with the result that spikes, bolts, and splice-bars were sheared off or torn apart. After the failure of attempts to arrest the creeping, the track was cut at the two abutments and at the east end of the east approach. The time of eight men (five by day, and three by night) is stated to be largely occupied in changing rails at these points. Where the openings are enlarging, short pieces of rail are taken out, and longer ones put in their place: where the openings are closing up, the process is reversed. Each operation is performed many times a day, and a careful record is kept, from which the following facts were obtained: the north track, when carrying an annual westward traffic of about 5,283,000 tons, moved west on the approach and up-grade 401 feet in a year, and on the bridge moved 264 feet; the south track, under an eastward traffic of 4,807,000 tons, crept east 414 feet on the approach, and 240 feet on the bridge, in the same time. The movement each way on the bridge was proportional to the tonnage; and the difference on the approach was doubtless due to the grade, as the changes of temperature would produce a slipping down hill, as previously stated.

Professor Johnson cites some explanations of this case that have been given: viz., the stopping of trains on the bridge; the deflection of the bridge itself by the weight of the train; the distortion of the arch, as a train enters a span, by its curve becoming less convex on the loaded portion, and more convex on the unloaded side, with a reversal of the distortion as the train passes over and off the span, the arch thus slipping under the rails; and, finally, the elastic rolling-out and recovery of the rails under successive wheels, as we may imagine a strip of rubber to move as a roller is passed over it. He does not think, however, that these causes are sufficient to account for so great a movement, and, in explain-

ing his theory, offers a preliminary illustration. Suppose a span of a bridge to have supports exactly alike, such as sliding surfaces, at the ends of the bottom chord, and a train to enter upon it. The bottom chord is stretched by the action of the load, and, as the end where the engine enters is held fast by the added weight, the other end must slip on its support in the direction of the train movement. As the cars pass off at this latter end, and hold it fast, the lower chord shortens, and recovers itself at the first bearing by slipping towards the train. Thus the bridge creeps in the direction of the moving train. If the points of support were under the upper chord, the direction of this creeping would be reversed. When rollers are placed under one end, and the other is anchored fast, the slip and recovery take place on the rollers, and no creeping results.

He notes that between the trucks of every car the rail springs up from the support an appreciable distance, by reason of the elasticity of its bearings, and that, when pressed down by the passage of the rear truck, any marked point on it has advanced a small distance. A wave-motion of the rail may be perceived in advance of every wheel, and an increment of forward movement every time a wheel passes. The more cars, the more movement for any train. The rail moves across the bridge by reason of the extension under flexure of the flange on which it rests. In proof of his position, he showed, by a model over which a loaded wheel was rolled, that a rail supported by the bottom flange will creep forwards, and that the same rail, when supported by its head, will creep backwards; and hence he argues that some point of support between the head and the bottom flange may be found, for which the tendency to creep shall be zero.

THE PATRIARCHAL THEORY.

IN 1861, Sir Henry Maine's work on 'Ancient law' was published. In that work he clearly set forth the importance of 'legal fictions' in the development of institutions. In this respect, his work will remain as a permanent contribution to the science of society. In the same treatise he made an exposition of the patriarchal theory of the origin of society; which had long been held by a class of writers in Europe. In his introduction he says,—

"This evidence establishes that view of the race which is known as the patriarchal theory. This theory is based on the scriptural history of the Hebrew patriarchs. All known societies were originally organized on this model. The eldest male parent is absolutely supreme in his household. His dominion extends to life and death, and is as unqualified over his children

¹ Journal of the Association of engineering societies, November, 1884.

The patriarchal theory. Based on the papers of the late John Ferguson McLennan. Edited and completed by DONALD MCLENNAN. London, Macmillan, 1885. 16+365 p. 8°.